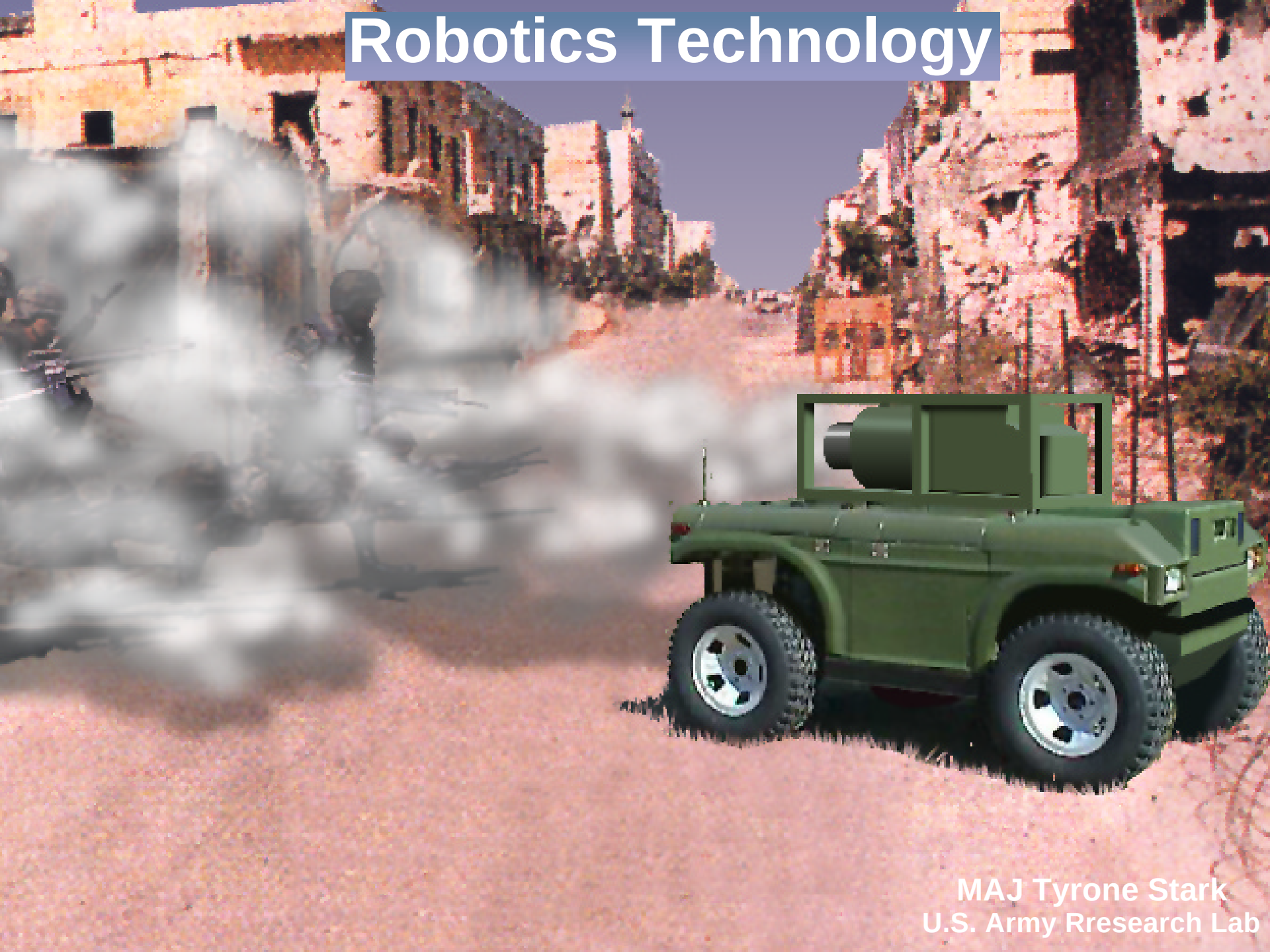
# Robotics Technology



MAJ Tyrone Stark
U.S. Army Rresearch Lab

# Army Robotics Research Program

## Strategy to rapidly advance robotics technology

- **Focused research:**
  - Perception
  - Intelligent control
  - Soldier-robot interface
- **Field Experience:**
  - Conduct early & continuous field tests
  - Promote troop interaction to focus research & foster parallel TTP development
- **Technology Testbed:**
  - Develop multiple approaches now & down select later
  - Provide infrastructure to foster rapid technology advancement
- **Work with other agencies:**
  - Leverage other Government efforts (NASA, NIST, DOE, DARPA)
  - Partner with Industry & Academia
    - Robotics Collaborative Technology Alliance
  - Collaborate with allied governments
    - Data Exchange Agreements




***Autonomous Land Navigation for the Objective Force***

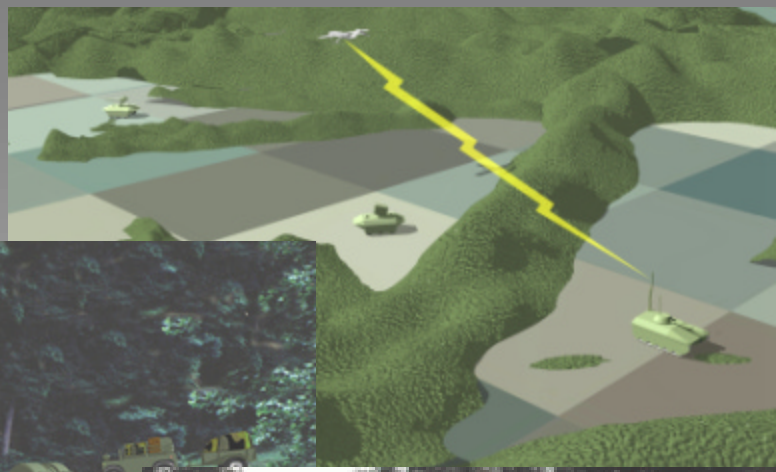
# Demo III Video

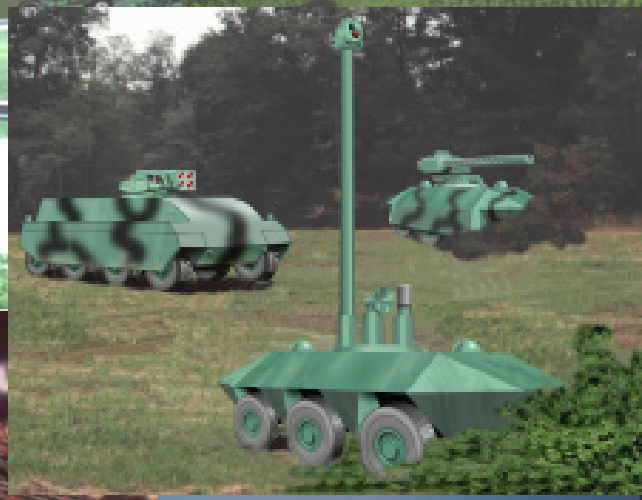
## Key Points

- On and off-road operation
- High speed relative to platform size and look-down angle
- Beyond line-of-sight follower with obstacle avoidance
- Military non-line-of-sight communications
- Small HMMWV-based operator interface
- Off-road formation behaviors
- Modular mission packages

# *Demonstration Video*

***Future applications for unmanned systems will only be limited by imagination and ingenuity…***





# The Demo III XUV

## Testbed for Advanced Autonomous Mobility Technology

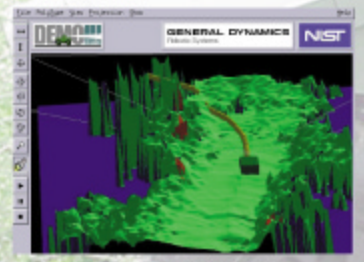
## *Intelligent technology integration is the key to success*

**Laser Scanner**

Object detection and sensing of local ground plane in close proximity to XUV

**Stereo Vision**

Passive object detection and sensing, especially for mid-range, from 50 to 500 meters




**Local Path Planning**

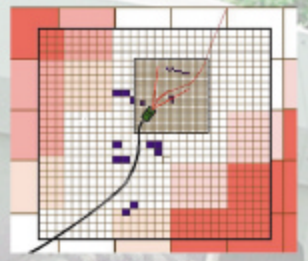
Rapid determination of optimal vehicle path based upon multi-factor cost maps

**Operator Control Unit (OCU)**

Small, modular man-machine interface and mission planning tools employing context sensitive pull down menus and standard military symbology

**RSTA Sensors**

Highly capable mission module enabling XUVs to participate in realistic military field exercises performing the scout mission to obtain troop feedback



**World Model**

Multi-resolution world model to optimize use of a priori and sensed environmental data for tactical and mobility planning

# Technology Thrusts for the Future

## *Perception – Intelligent Control – Soldier-machine Interface*

**Near-Field Perception**

***Improved sensors***
***(Fol-Pen Radar, Ladar)***
***Object classification***
***Sensor fusion***

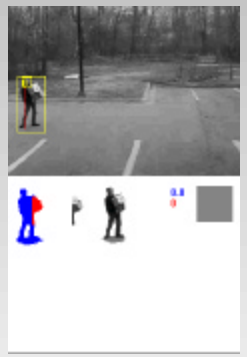
**Mid-Range Perception**

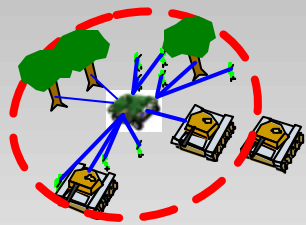
***Sensors (Stereo, Radar)***
***Object Classification***
***Coarse mapping***

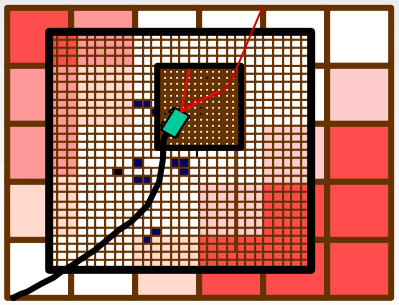
**Soldier-Robot Interaction**

***Cognitive Load***
***Span of Control***
***Trust in Automation***

**360° Safeguarding**







**World Model**

***Additional levels on vehicle***
***Richer information set – UAV data***

**Road Following**

# *The Army Robotics Research Program is advancing technology and working with soldiers*

***…to provide the technological foundation for tomorrow's unmanned ground vehicles***